ARM
CLIMATE RESEARCH FACILITY

FACT SHEET

Purpose
As a national user facility, the ARM Climate Research Facility is a unique asset for national and international research efforts related to global climate change. Scientists around the world use its capabilities to study the interactions between clouds, aerosols, and energy feedback processes in the atmosphere, ultimately leading to advances in climate models.

Sponsor
The U.S. Department of Energy's Office of Science

Participants
Nine national laboratories and numerous government agencies, universities, private companies, and foreign organizations work together in managing and operating the ARM Facility.

Features
- Three primary locations representing a range of climate conditions—U.S. Great Plains, Alaskan North Slope, and the Azores—host heavily instrumented sites that gather massive amounts of climate data.
- ARM Mobile Facilities provide flexible instrument platforms for conducting field experiments lasting from 6 to 12 months in any environment, from the cold of the poles to the heat of the tropics.
- The ARM Aerial Facility uses aerial platforms to obtain key in situ and remote sensing measurements that contribute to the fundamental understanding of clouds, aerosols, and radiation.
- Serving nearly 1300 registered scientific users from approximately 15 federal and state agencies, over 200 foreign and domestic universities, across 30 countries, the ARM Data Archive collects and delivers about 17 terabytes of data per month.

www.arm.gov

U.S. DEPARTMENT OF ENERGY | Office of Science

U.S. Department of Energy

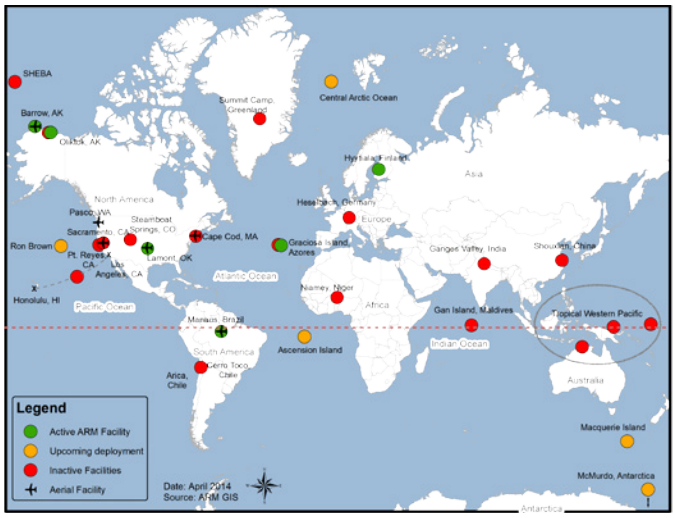
Atmospheric Radiation Measurement Climate Research Facility

The Atmospheric Radiation Measurement (ARM) Climate Research Facility is a key component of the U.S. Department of Energy's efforts to better understand and predict Earth's climate in order to develop sustainable solutions to the nation's energy and environmental challenges. ARM was the first climate research program to deploy a suite of cutting-edge instrumentation to continually measure cloud and aerosol properties and their impacts on Earth's energy balance. This strategy revolutionized scientist's ability to collect long-term statistics of detailed cloud properties and now serves as a model for programs around the world.

As a scientific user facility with fixed and mobile sites across the globe, ARM facilities are used by scientists to obtain long-term measurements of radiative fluxes, cloud and aerosol properties, precipitation interactions, and related atmospheric characteristics in diverse climate regimes. Long-term continuous measurements are essential to gather enough data to fully characterize the evolution of atmospheric properties and evaluate models under different meteorological conditions. This measurement approach provides unparalleled examination of atmospheric processes and evaluation of model performance.

Data collected at ARM sites have yielded insights into a range of scientific issues, including the absorption of radiation by clouds and water vapor—factors that trigger cloud formations—and detailed composition of aerosol and cloud properties, such as ice crystal sizes. Observations have led to greatly improved techniques for retrieving cloud properties from the ground, revealing ways to improve climate models.

Continued ARM research will help reduce uncertainties in climate models and advance predictive capabilities.



Facilities Enabling Science Around the World

Strong collaborations between nine DOE national laboratories enable the ARM Facility to successfully operate in remote locations around the world. The ARM Facility manages long-term, continuously operating sites in three regions referred to as the Southern Great Plains, North Slope of Alaska, and Eastern North Atlantic.

Representing a region of widely varying conditions, the Southern Great Plains site in Oklahoma and Kansas is the first field measurement site established by the Facility and is the world's largest and most extensive climate research field site. This site has served as the testbed for ARM measurement development for over 20 years.

Situated on the edge of the Arctic Ocean, the North Slope of Alaska locale provides important information because unique climate processes—such as planetary heat loss from the poles and extensive sheets of ice that affect solar absorption and sea level—occur at high latitudes.

One of the newest ARM observation facilities, the Eastern North Atlantic is located off the coast of Portugal in the Azores on Graciosa Island. This site provides a rare data set from the subtropical marine boundary layer, where climate models show the greatest discrepancy in how clouds change, a particular challenge for climate models.

With the growing interest in high-resolution model simulations, the ARM Facility is currently developing the Southern Great Plains and North Slope of Alaska sites into "megasites." The new megasites will feature additional measurements to sample spatial variability and support high-resolution model simulations to advance climate model development through better observations of atmospheric processes.

Deployable Measurement Capabilities

Designed to explore science questions beyond those addressed by the current sites, the ARM Mobile Facilities are equipped with instrumentation and data systems similar to the long-term sites. Each mobile facility can be deployed to locations around the world for campaigns usually lasting 6 to 12 months.

The ARM Aerial Facility complements ground-based measurements of cloud and atmospheric properties by conducting instrumented airborne measurement campaigns. In situ and remote sensing data acquired from aircraft provide critical information for studying clouds and aerosols. The data are also used to evaluate and improve remote sensing measurement techniques.

Field campaigns featuring the ARM Mobile Facilities and Aerial Facility are chosen based on a competitive process through an annual call for proposals to the science user community (***www.arm.gov/campaigns***).

Data Management

Data collected through these observation facilities are stored in the ARM Data Archive. Selected data sets are further analyzed and tested to create enhanced data products, and software tools are provided to help open and use these products. All data and enhanced products are freely available to the science community via the ARM Data Archive (***www.archive.arm.gov***) to aid in further research.

For more information, contact:

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